DISSERTATION ON
A PROSPECTIVE COMPARATIVE STUDY BETWEEN TRANSVAGINAL SONOGRAM AND HISTOPATHOLOGICAL EXAMINATION IN PERIMENOPAUSAL AND POSTMENOPAUSAL WOMEN WITH BLEEDING PER VAGINA

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CERTIFICATE

This is to certify that this dissertation entitled **"A PROSPECTIVE COMPARATIVE STUDY BETWEEN TRANSVAGINAL SONOGRAM AND HISTOPATHOLOGICAL EXAMINATION IN PERIMENOPAUSAL AND POSTMENOPAUSAL WOMEN WITH BLEEDING PER VAGINA"** is a bonafide original work of **Dr.C.SUMATHI** Post Graduate Student (2006-2009) in the department of Obstetrics and Gynaecology, Government RSRM Hospital, Stanley Medical College, Chennai in partial fulfilment of the regulations laid down by the Tamil Nadu Dr.M.G.R.Medical University, Chennai for M.D. (Branch II) Obstetrics and Gynaecology examination held in March 2009.

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DECLARATION

I **Dr.C.SUMATHI**, hereby declare that this dissertation on **"A PROSPECTIVE COMPARATIVE STUDY BETWEEN TRANSVAGINAL SONOGRAM AND HISTOPATHOLOGICAL EXAMINATION IN PERIMENOPAUSAL AND POSTMENOPAUSAL WOMEN WITH BLEEDING PER VAGINA"** is an original work done by me during the post graduation course between 2006-2009, and herewith I am submitting this to the Tamilnadu Dr.M.G.R. Medical University for the M.D. Branch II Obstetrics and Gynaecology Exam, March 2009.

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CONTENTS

INTRODUCTION

Dysfunctional uterine bleeding is one of the most frequently encountered conditions in gynaecologic practice and forms about 10% of all gynaecological admissions.

In Government Raja Sir. Ramasamy Mudaliar (RSRM) Lying – In Hospital in the year 2006-2008, 700 cases of the 2000 admissions in the Department of Gynaecology were for dysfunctional uterine bleeding giving an incidence of 20% of these.

5% - less than 20 years (Pubertal age group)

60% - between 20-40 years (Reproductive age group)

35% - more than 40 years (perimenopausal and postmenopausal)

The main concern in perimenopausal bleeding and post menopausal bleeding is that the bleeding could be the only external manifestation of a hidden serious pathology such as endometrial carcinoma. Also, endometrial hyperplasia which is a fore runner of endometrial carcinoma is a common finding in women with perimenopausal bleeding.

The incidence of endometrial carcinoma is rising both in relation to cancer cervix and in absolute terms and the disease which was formerly confined to the postmenopausal women is now occurring with increased frequency in middle age and perimenopausal women. Also with the advent of

hormone replacement therapy postmenopausal women require constant surveillance of their endometrium.

Curettage has long been considered to be the “Gold Standard” for the diagnosis of perimenopausal and post menopausal uterine bleeding.

Dilatation and curettage has a failure rate of 12-30%. Undirected sampling either through curettage or suction aspiration is fraught with error in cases, in which the abnormality is not global, but focal.

With advent of transvaginal sonogram, Gynaecologist now have a simple outpatient method of studying endometrium for detecting malignant lesion or their precursors at an earlier stage.

The thickness and internal echo texture of the endometrium in the various phases of menstrual cycle as seen in transvaginal sonogram correlates well with endometrial histology.

The echogenicity of the endometrium has certain characteristics during various phases of the menstrual cycle, thus enabling the histology to be evaluated with precision by examining with transvaginal sonogram

During the early proliferative phase the endometrial thickness is 2-4mm. Endometrium functionalis is hypoechoic or isoechoic and endometrium basalis echogenic.

During the periovulatory phase the endometrium, has trilaminar appearance or triple sign-lumen is echogenic surrounding which there is hypoechoic endometrium functionalis and the echogenic endometrium basalis. The thickness ranges from 6-12mm.

During secretory phase, the whole endometrium from basalis to lumen is very echogenic. The greatest thickness is achieved during secretory phase measuring upto 14mm in width.

In postmenopausal patients, thickness less than 4-5mm or thin pencil line echo is usually associated with tissue insufficient for diagnosis. In general, normal thickness in postmenopausal patients is 4mm.

Endometrial carcinoma is diagnosed at an earlier stage by loss of the subendometrial halo and later myometrial invasion is accurately documented.

Other pathologic conditions of the endometrium and myometrium such as myomatous polyps, endometrial polyps, adenomyosis are also well visualised.

Thus with transvaginal sonogram the endometrial pathology can be visualised, where as fractional curettage is a blind procedure. Thus the transvaginal sonogram can be used as a better diagnostic procedure as it supplements the short comings of fractional curettage.

This study proposes to correlate the finding of the two diagnostic modalities used in the evaluation of women with perimenopausal and postmenopausal bleeding namely transvaginal sonogram and histo pathological examination.

AIM OF THE STUDY

1. To determine the value of transvaginal sonography in detecting endometrial pathology especially endometrial polyps, myomatous polyps and abnormal endometrial architecture especially hyperplasias and endometrial carcinoma in perimenopausal and postmenopausal bleeding.

2. To compare the thickness of endometrium in patients with perimenopausal and postmenopausal bleeding with their histopathology reports and evaluate the technical and practical difficulties and diagnostic accuracy of the procedure.

MATERIALS AND METHODS

This is a prospective study of 200 women carried out during the period 2006-2008 – A hundred women with postmenopausal bleeding and a hundred women with perimenopausal bleeding.

GROUP A : Comprised of 100 women with postmenopausal bleeding.

Inclusion Criteria

- Age above 40 years.
- Menopause more than 1 year.
- Not on any Hormone replacement therapy.
- No demonstrable pelvic pathology
- Clinically no mass per abdomen and bimanual pelvic examination.
- No evidence of blood dyscrasias.

Exclusion Criteria

- Patients with carcinoma cervix
- Patients on Oral contraceptive pills.
- Patients with fibroid polyp.
- Adnexal swelling
- Patients with blood dyscrasias.

Group B : Comprised of 100 perimenopausal women with abnormal uterine bleeding.

Selection Criteria :

- The patients were all above 40 years of age.
- Not yet attained menopause.
- Uterus was normal to 12 week size and adnexa were clinically normal
- On speculum examination cervix was healthy.
- Cancer cervix and other benign pathological lesions of cervix were excluded.

All the patients were from Government Raja Sir Ramasamy Mudaliar (RSRM) Lying – In Hospital, Chennai.

All these patients were subjected to transvaginal sonography prior to fractional curettage.

Method

A 7.5 MHz Elcot transvaginal sector probe with phased array and end firing potential were used.

- All the patients were asked to empty their bladder prior to the examination.
- The probe is covered with a sterile sheath or condom containing the acoustic gel.
- The scan was performed with the patient in a supine position.

- The transducer was introduced into the posterior vaginal fornix.

The uterus was scanned in long axis and coronal views with special emphasis on endometrium. The scanning of the uterus was first done in the sagittal plane from fundus to the internal os. The regularity of the uterus was noted. The length, anteroposterior measurements and transverse dimensions of the uterus were noted and endometrial volume calculated.

Anteroposterior measurements of endometrial thickness were taken from basalis to contralateral basalis in the long axis of the endometrium. Oblique semicoronal views should be avoided as this may cause the endometrium to appear thicker.

Uterine cavity examined systematically in both sagittal and coronal views for the presence of submucous fibroid polyps, endometrial polyps, adenomyosis or abnormal endometrial architecture.

If there is suspicion of endometrial carcinoma, the evidence and extent of myometrial invasion were noted. Now the probe angled to the right or left of midline in the sagittal plane to image the ovaries. The three dimensions were measured. The internal echo texture of the ovaries were also imaged and any abnormalities were noted.

The entire pelvis was additionally examined to rule out any other pathology.

The results of the transvaginal sonogram were interpreted as

- Normal endometrium
- Thickened endometrial echo or abnormal endometrial architecture
- Myomas
- Adenomyosis
- Polypoid lesions
- Pyometra
- Endometrial hyperplasia and a suspicious endometrial carcinoma.

Fractional curettage was performed in all these patients as a inpatient procedure. Patients were placed in lithotomy position. Under aseptic precautions perineum was painted and draped. A routine pervaginal examination carried out. Endocervical curetting was taken. Uterus was then sounded and its length noted. After serial dilatation of cervix, a blunt curette was introduced and all quadrants curetted thoroughly. The curettings were sent for histopathological examination in formalin. The biopsy reports were studied.

Endometrial pattern studied in transvaginal sonogram were correlated with histopathological reports. Almost all of these patients underwent hysterectomy either abdominal or vaginal.

REVIEW OF LITERATURE

History of Ultrasound

The word “SONAR” stands for Sound Navigation And Ranging. Sonar utilizes a frequency of 3.5 MHz to 10 MHz beyond the range of human audibility limit. Ultrasound travels at a speed of 1560 m/sec in human tissue.

“Sergal Sokolovin” a Russian Scientist is called as the “Father of Ultrasound”. He emphasized the potential importance of Sonar in 1929.

Dr.Karl Dussik in Austria, applied ultrasound in medical diagnosis.

In 1951, Wild and Reig reported a 90% accuracy in the diagnosis of cystic versus solid lesions of various organs using the scan technique.

In 1955, Ian Donald and Tom Brown designed the contact scanner.

In 1961, Biparietal diameter was first measured by Ian Donald. During the same peroid, Campbell began working on the growth patterns of fetus as measured by serial Biparietal diameter. In 1973 – gray scale presentation was introduced.

“Piezo electric effect” was first discovered by Pierre Curie in 1880.

Transvaginal ultrasound was first introduced in 1984 by Schwimer S.R. and Lebovic J who used a 5 MHz, 13 mm transducer that was not specifically designed for vaginal work.

In 1969, a total number of 6907 Dilatation and curettage were reviewed and the concept arrived was that the curettage was simple, harmless, and easy to perform, that it may be done by the newest intern without difficulty. Under general anaesthesia it also provides an ideal opportunity for thorough examination of pelvic organs **(Mc Elin et al 1969)**[1].

With the introduction of Transvaginal sonogram, the transducer proximity to the endometrium with the absence of full bladder compressing the endometrium, and also the usage of higher frequency and reduced attenuation of sound beam results in a better overall image quality.

Nasri et al in their comparative study between Transabdominal and transvaginal sonography concluded that transvaginal sonography should replace Transabdominal sonography in the initial assessment of gynaecological disorders **(Nasri et al 1999)** [2].

Lewin et al showed that transvaginal sonogram can reliably diagnose endometrial thickness greater than 5 mm to be 100% sensitive and 64% specific in identifying endometrial pathology. **(Lewin et al 1996)** [3].

Kufahl. J and Pedersen.I et al[4] showed a sensitivity of 90.3% and a specificity of 24.8% for a cutoff value of 4mm by transvaginal sonogram.

Malinova M and Pehlivanov et al adopted the transvaginal approach to increase the accuracy of diagnosis **(Malinova et al 1995)**[5].

The **'classification tree'** method was used to identify the cutoff values of sonographic endometrial thickness that could be indicative of a class of uterine pathology. No case of endometrial cancer was found with a cutoff point of 5mm endometrial thickness, whereas all patients with endometrial thickness more than 15mm at transvaginal sonogram had an endometrial carcinoma. In a group of patients with endometrial thickness between 6 and 14 mm, they found a normal atrophic endometrium, benign and malignant pathology. **(Loverro et al 1999)**[6].

Ramirez et al (2001)[7], proposed that an endometrial thickness grater than 5mm warranted further investigation in the form of biopsy.

Transvaginal sonography is a simple non-invasive procedure. It can be used as a screening test for patients with perimenopausal and postmenopausal bleeding **(Tongsong et al 1994)**[8]. Endometrial thickness of less than 7mm was found to be predictive of normal endometrium.

According to **Osmer et al (1990)**[9], since all cases of endometrial cancers were associated with an endometrial thickness of more than 4mm. It is the cutoff level above which an endometrial study will be mandated.

Li S, Gao S stated that the endometrial thickness of less than 4mm is highly unlikely to be associated with carcinoma. Diagnostic curettage may be avoided in patients who had endometrial thickness less than 4mm **(Li S , Gao S et al 1997)**[10].

Campbell et al (1992)[11] stated that the endometrial thickness less than 5mm is highly unlikely to be associated with carcinoma where as a thickness greater than 8mm requires biopsy.

PERIMENOPAUSAL AND POSTMENOPAUSAL BLEEDING

In both Western and Asian studies the mean age of menopause is fairly constant at 50-51 years (Frommer 1964).

Perimenopause or menopausal transition is defined by World Health Organisation (WHO) as the period in the beginning 2-8 years prior to final menstrual period and lasting upto 12 months after the final menstrual period.

PERIMENOPAUSAL BLEEDING:

In the perimenopausal women, bleeding begins with increased variability of menses or the first skipped period and ends with final menstrual period.

It comprised of an early phase in which cycles may be irregular but a menstrual period occurs atleast once in every 60 days and later stage, during which prolonged amenorrhoea of 3 to 10 months followed by menstrual bleeding is observed.

The main cause of perimenopausal bleeding include

Endometrial hyperplasia	-	15-25%
Benign lesion of the uterus-myomas	-	10%
Dysfunctional uterine bleeding	-	15-20%
Malignancies of the reproductive tract	-	10-15%
Cancer cervix	-	10-12%
Cancer endometrium	-	2-4%
Adenomyosis	-	20-25%
Exogenous estrogen therapy	-	3 -5 %

Miscellaneous causes are : - 10%

Endometrial polyps

Endometritis

Cervical polyp and erosion

Rarely pregnancy related causes

POSTMENOPAUSAL BLEEDING

Normally one year period of amenorrhoea after the age of 40 is considered as menopause. However, vaginal bleeding occurring anytime after six months of amenorrhoea in women of menopausal age should be considered as postmenopausal bleeding and investigated. Even without

amenorrhea or irregular bleeding, if a woman over the age of 52 years continues to menstruate, she needs investigation to rule out endometrial hyperplasia and malignancy of the genital tract. **(Shaw et al)**[12]

The main causes of postmenopausal bleeding includes

Endometrial atrophy	-	60-80%
Endometrial polyps	-	2-12%
Endometrial hyperplasia	-	5-10%
Estrogen replacement therapy	-	15-25%
Endometrial cancer – sarcoma	-	10%
Cancer cervix	-	10%
Atrophic vaginitis	-	5-10%

Endometrial Hyperplasia

In the perimenopausal period, the menstrual cycles tend to become anovulatory and acyclical, with unopposed estrogen secretion leading to hyperplasia of the proliferative endometrium **(Kurman RJ et al 1985)** [13].

Classification	Risk of progression to cancer (Percentage)
Simple cystic without atypia	1
Complex adenomatous without atypia	3
Simple cystic with atypia	8
Complex adenomatous with atypia	29

Fibroids are an important cause of perimenopausal bleeding. If a woman in the perimenopausal and postmenopausal age group complains of irregular or continuous vaginal bleeding, the possibility of coincidental uterine cancer should be excluded.

Adenomyosis often coexists with uterine fibromyomas and endometrial carcinoma.

Endometrial atrophy is the most common endometrial finding in women with postmenopausal bleeding (60-80%). Endometrial biopsy often yields insufficient tissue or only blood clots and usually there is no additional bleeding after biopsy.

Endometrial polyps account for 2-12% of postmenopausal bleeding. The diagnosis of polyps is often missed by dilatation and curettage or office endometrial biopsy. Malignant transformation in an endometrial polyp is estimated to be as high as 0.5 - 2.7% **(Novak et al)**[14]. Unrecognised and

untreated polyps may be a source of continued or recurrent bleeding eventually leading to unnecessary hysterectomy.

They are invariably hyperechoic relative to the surrounding tissues and sometimes contain small cavitations.

Endometrial cancer: Perimenopausal women with endometrial carcinoma invariably have abnormal uterine bleeding which is often characterised as menometrorrhagia or metropathia haemorrhagica.

Recently certain factors led to an increasing awareness of an emphasis on diagnosis and treatment of endometrial cancer. These include prolonged life expectancy, earlier diagnosis and postmenopausal use of hormone replacement therapy, the availability of easily applied diagnostic tools and a clear understanding of the premalignant lesions of the endometrium. The incidence of endometrial carcinoma in Indian women is 1.6% **(Ratnam et al)**[15].

HORMONE REPLACEMENT THERAPY:

In postmenopausal women on hormone replacement therapy, it has been suggested that endometrial sampling is indicated in any bleeding that occurs beyond the expected time of withdrawal following progestin therapy. In patients on classic sequential method, bleeding before or on day ten is associated with endometrial proliferation and needs biopsy. A significant

change in withdrawal bleeding prompts endometrial sampling. **(Timmermans et al 2008)**[16].

TRANSVAGINAL SONOGRAM

Dubinsky.TJ et al[17] has described that transvaginal sonogram is preferred over biopsy because,

1. Less invasive procedure
2. Painless
3. No complications
4. May be more sensitive for detecting carcinoma than blind biopsy.

Ultrasonography may also be used as a first line investigation in women with abnormal uterine bleeding, because it is cost effective, sensitive and well tolerated method in combination with physical examination and endometrial biopsy.

As the endometrial histology can be predicted with accuracy depending on the endometrial thickness and internal architecture of the endometrium, it actually became “Sono Microscopy” wherein structures that is not discernible with the naked eye can be appreciated.

Wolman et al [18] at Serlin Maternity Hospital in their prospective study, transvaginal sonography as an aid in determining which woman with postmenopausal bleeding should undergo curettage or not.

Grigoriou et al[19] were to determine the value of screening transvaginal sonogram for the evaluation of endometrial abnormalities in women with postmenopausal bleeding after excluding women with any pelvic symptoms or on hormone replacement therapy. Endovaginal ultrasound is a valuable diagnostic instrument as sensitive as dilatation and curettage.

Normal anatomy of the corpus varies with age and parity.

Length of uterus in various age groups are :

Postpubertal - 5-6 cm

Reproductive - 7-8 cm

Postmenopausal - 4-6 cm

The echogenicity and thickness of the normal endometrium will vary depending on the phase of the menstrual cycle.

The normal endometrial thickness during the various phases of the menstrual cycle and during the postmenopausal period are given in the following table. The thickness is measured in the long axis from basalis to contralateral basalis. The measurement should include only tissue and not fluid.

Phase	Thickness (mm)
Menstrual	2-4
Early Proliferative	4-6
Periovulatory	6-8
Secretory	8-14
Postmenopausal	4-8
Postmenopausal with hormone replacement therapy	4-10
Tissue insufficient for diagnosis	Less than 4-5mm

Archer et al in 1999[20] has described that the endometrial thickness measured at the thickest part of the longitudinal plane for which the uterus was scanned transversely and longitudinally. Endometrial biopsy was taken within 3 days of transvaginal ultrasound measurements.

Not only the thickness, the echogenicity of the endometrium has certain specific characteristics during the various phases of the menstrual cycle, thus enabling the histology of the endometrium to be evaluated with precision by examining with transvaginal sonogram.

During the menstrual phase, the endometrium appears as an echogenic uninterrupted layer of 1-4mm in the total anteroposterior width.

A prospective study in 192 patients with postmenopausal bleeding and 97 women without bleeding found that 74.8% had a positive result which

include proliferative endometrium and secretory endometrium **(Gunner.et al1996)**[21].

Grunfeld has described three patterns in evaluating the changes in the normal endometrium.

Follicular Phase

Pattern I : During the early proliferative phase the thickness is 2-4 mm. Endometrium functionalis is hypoechoic or isoechoic and endometrium basalis is somewhat echogenic.

Pattern II : Ultrasound appearance of late follicular endometrium is characterized by three layers i.e. Trilaminar appearance or triple sign.

Middle layer represents the lumen of the endometrial cavity. The lumen is echogenic because the endometrium is coated with mucus which acts as an interface and reflects ultrasound.

Surrounding the lumen is the hypoechoic endometrium functionalis and the echogenic endometrium basalis. There is an increase in echogenicity from the basal layer upwards but the inner layer still has some hypoechogenic changes.

The endometrium functionalis is hypoechoic in the follicular phase because of the homogenicity of the oedematous stroma and the lack of arteriole invasion. The basalis is always echogenic because of increased

edema and vascularity of the basalis. In a normal cycle, the endometrial thickness ranges from 6-12mm in the late follicular phase. Endometrium grows in the late proliferative phase at a rate of 0.5mm /day.

The trilaminar appearance is characteristic of periovulatory endometrium and was present in 92% of late proliferative phase biopsies performed by Forrest. Transmission of the ultrasound and posterior acoustic enhancement are also characteristic of follicular phase and is present in 90% of cases.

Pattern III : In the secretory phase, the whole endometrium from basalis to lumen is very echogenic. The increase in echogenicity, most probably is due to increase in luteal phase secretions and vascularity. The increase in echogenicity is seen due to the elevations of progesterone but may precede the rupture of follicle. Cul-de-sac fluid is often seen behind the uterus on ultrasound and helps to confirm that ovulation has occurred. The endometrium achieves its greatest width in the mid secretory phase measuring upto 14mm in width.

Getpook et al (2006)[22] proposed that endometrial thickness of 8mm or less is less likely to be associated with malignant pathologies in perimenopausal uterine bleeding.

The sensitivity in detecting endometrial malignancy was 94.44% for endometrial biopsy and 100% for transvaginal sonogram, when the endometrial thickness was more than 8mm**.(Giusa Chiferi et al)** [23]

According to **Minagawa et al 2005** [24] all women with atypical uterine bleeding for postmenopausal women with endometrial thickness more than 5mm, and perimenopausal women with thickness more than 20mm is the cutoff level, above which an endometrial biopsy will be mandated.

Below a cutoff of 4-5mm in the anteroposterior thickness of the endometrium for women with postmenopausal bleeding, there may not be significant associated pathology. Less than 4-5mm or a thin pencil line echo is usually associated with tissue insufficient for diagnosis.

Those more than 5 mm may need endometrial sampling. Thus transvaginal sonogram may be helpful in distinguishing patients with minimal endometrial tissue caused by postmenopausal atrophy and patients with significant amount of endometrial tissue or polyps and are in need of further evaluation.

PATHOLOGIC CONDITIONS

Recent studies with transvaginal ultrasound suggest that this modality may be of use in detecting endometrial abnormalities like polyps, endometritis, hyperplasia and carcinoma.

Leiomyoma are seen as echodense defects within the myometrium. They are typically so dense that shadowing is apparent distal to the fibroid. Endovaginal sonography offers the opportunity to visualize the relationship of the fibroid to the endometrial cavity.

Adenomyosis does not have clear borders and is less dense than leiomyoma. They do not have a shadow like fibroids and are commonly cystic. They are seen as mottling within the myometrium. They may present as a myometrial mass or as cystic structures, if the glands begin secreting within the inner myometrium.

Endometrial polyps are seen as endometrial filling defects. Scanning for endometrial contour defects should be done in the follicular phase because the hypoechoic endometrium serves to contrast against echogenic masses. The presence of a filling defect is 70% sensitive and 95% specific when compared with hysterosalphingogram (Blumen feld and Turner 1996).

Endometrial atrophy in the postmenopausal women results in a thin hypoechoic endometrium on transvaginal sonography. Abnormal or suspicious endometrial pattern occurs in a thick and hyperechoic pattern.

Endometrial hyperplasia in postmenopausal women appears as a thickened hyperechoic endometrium with an intact subendometrial halo microinvasive endometrial carcinoma may have similar ultra sonic features.

Once the invasion is established, the subendometrial halo consisting of compact myometrium is lost. This is the first ultrasonic feature of invasion seen sonographically.

With more advance myometrial invasion a distinct tumour myometrial interface can be visualised.

Myometrial invasion may also produce a thickened and irregular central endometrial interface with echogenic or hypoechoic pattern combined with infiltration of hyperdense structures within the myometrium.

In an attempt to standardize measurements of myometrial invasion, schoenfeld et al measured invasion from the endometrial lumen to the most distant tumour interface. This distance was then divided by the total thickness of the uterine myometrium, if the lumen could not be discerned, the extent of myometrial invasion was estimated by dividing the total anteroposterior uterine distance by the total endometrial width myometrial invasion was suspected, if this ratio exceeded by 30%.

Transvaginal sonogram is frequently used in preoperative assessment of myometrial invasion. In a group of 25 patients histologically proven endometrial cancer was determined. Myometrial invasion with ultrasound reported a sensitivity of 93% , when the invasion was greater than 50%. The diagnostic accuracy was 81%.**(Prompeler et al 1994)** [25].

Cacciatore et al[26] used pre-operative ultrasound to stage 93 patients with endometrial cancer and were able to predict correctly myometrial invasion in 80% sonographic staging was accurate in 91% of cases.

Endometrial and Endocervical polyps

They are invariably hyperechoic relative to the surrounding tissues and sometime contain small cavitations.

Intracavitory and Submucous leiomyoma

They are usually hypoechoic where as polyps and endometrial hyperplasia do not alter the basalis myometrial interface, the myoma and invasive cancer are characterized by the disruption of this interface.

Endometrial Volume: An endometrial volume can be calculated by multiplying its length by long axis, with anteroposterior and transverse dimensions. This determination has clinical application in the prediction of the amount of decidua or abnormal endometrial tissue that is present and can be removed by dilation and curettage.

Gruboeck et al[27] suggested that volume measurement of the endometrium are much more promising than endometrial thickness in screening for cancer because they are more sensitive and have a greater positive predictive value.

They studied 97 patients with cancer, hyperplasia, polyp and normal or atrophic endometrium and reported sensitivity (100 % for volume and 83% for thickness). Positive predictive value (92% for volume and 55% for thickness.)

Since many gynaecologist have felt the need for a simple, safe and noninvasive method which could be employed as a screening procedure for detecting endometrial abnormalities and neoplasia. A routine pap smear detects only 50% of cases with endometrial cancer.

Curettage has long been considered to be the gold standard for the diagnosis of perimenopausal and postmenopausal uterine bleeding. A fractional curettage can provide definitive results . **Larson et al**[28] showed that dilatation and curettage was significantly more accurate in identifying cancer and predicting final grade of the disease. Still the false negative rate of dilatation and curettage for the diagnosis of endometrial cancer may be as high as 2 to 6%.

Epstein et al[29] showed that the study to compare the frequency of rebleeding and endometrial growth during a 12 month followup period between woman with postmenopausal bleeding and endometrial thickness less than 5mm managed by dilatation and curettage and those managed by ultrasound followup after 3, 6, and 12 months. If these women are managed by ultrasound followup endometrial sampling should be performed if the endometrium grows, not necessarily in the case of rebleeding without endometrial growth.

In women with endometrial thickness less than 7mm, endorette and dilatation and curettage showed similar results. In women with more than 7mm endorette yield insufficient samples more often than dilatation and curettage and missed all polyps and most hyperplasia diagnosed by dilatation and curettage**.(Epstein E, Skoog L, et al 2001)**[30]

Curci-C et al[31] used Transvaginal sonogram and fractional explorative curettage and histopathological examination of the material obtained from the cervical canal and uterine cavity on 35 women. Transvaginal sonogram does not provide completely safe differentiation between hyperplasia and endometrial carcinoma. Endometrial thickness of 3 mm and less gives a relatively safe prediction of endometrial atrophy, whereas the thickness above 3mm requires explorative curettage and histopathological examination of the endometrium, no matter if the women has or not uterine bleeding.

Rodriguez et al[32] did a pathologic study of 25 hysterectomy specimens. Pipelle's device sampled only 4% of the endometrial surface. Vibra aspirator sampled 41% of the endometrial surface.

Thus tumours localised in a polyp or a small area of endometrium may go undetected by endometrial sampling or even with dilatation and curettage. Hence transvaginal sonogram can enhance the anatomic diagnosis and supplement the shortcomings of fractional curettage.

PROCEDURE OF TRANSVAGINAL SONOGRAM

Until recently, the primary method for detecting gynaecological pathology was bimanual pelvic examination, with confirmatory or additional information supplemented by transabdominal ultrasound.

Despite technical advances, transabdominal ultrasound imaging of the female reproductive tract was limited by attenuation of the sound beam by tissues of the anterior abdominal wall, distended urinary bladder, precluding the use of high frequency transducers (5 MHz) and the inability to correlate areas of visible pathology with direct palpation. Image resolution has improved dramatically with the introduction of transvaginal sonogram. The transducer is closer to the pelvic organs, so higher frequencies can be used, reducing attenuation of the sound beam resulting in improved overall image quality.

PATIENT PREPARATION

Patient was informed about the procedure. She is asked to empty her bladder completely. This contributes greatly to patient comfort and acceptance of this technique. The best position is the dorsal position employed for vaginal examination. A transabdominal sonogram is done prior to vaginal study to exclude large masses and if uterus is more than 10 cms as in such conditions, the vaginal study will be suboptimal due to its limited field of view. In all other cases, transvaginal sonogram can be performed in lieu of abdominal scanning.

TRANSDUCER PREPARATION

Vaginal transducer is between 5-7.5 MHz in frequency and the size of the sector image is usually between 90^0 and 115^0. The image is produced from an end firing transducer or a transducer that is angled upto 30^0 off axis. Focal zones range from 1-8 cm. The transducer should be covered by a condom filled with approximately 5ml of ultrasonic gel. Condoms that contain spermicidal agents should be avoided in cases of infertility.

Additional gel may be applied to the outside of the condom prior to its insertion, but this should be omitted in cases of infertility. Following completion of examination, the transducer assembly should be immersed in disinfectant for ten minutes.

PROBE MANIPULATION

Uterine corpus is an important structure in transvaginal sonogram and serves as a useful anatomical land mark for targeted organ imaging. Transducer orientation is unique in vaginal scanning, with the longitudinal plane directed from the patient's feet towards her head. Transverse scans are obtained in a coronal plane by rotating the transducer ninety degrees counterclockwise. Adnexa are optimally imaged by positioning the transducer somewhat obliquely towards the contralateral side of the pelvis.

Confusion can also occurs, because the actual position of the ultrasound beam is 90^0 off axis from the image on the monitor. This result in

the longitudinal images being displayed on the monitor in a ninety degree counter clockwise direction from their actual orientation.

Ultrasound transducers have a reference mark. With the reference mark pointing up, left side of the screen represents a cephalad orientation and the top of the screen represents the anterior abdominal wall. With this view, an anteverted uterus points up and to the left while a retroverted uterus points down and to the right.

Anatomic changes due to scanning with an empty bladder must also be considered when performing vaginal ultrasound. The uterine fundus becomes much more anteverted. In addition the ovaries often change position following bladder decompression.

SLIDING TEST : It may be helpful to place one hand on the patient's lower abdomen while performing transvaginal sonogram in an effort to optimally position the ovaries in the transducer's field of view. Also areas of focal tenderness can be elicited with the movement of the transducer. Transvaginal sonogram can also be used in the followup of women on tamoxifen therapy for breast cancer and women on hormone replacement therapy after menopause**.(Weaver et al 2005)** [33].

Omodei et al (2004) [34] also stated that the value of endometrial thickness as a marker of endometrial abnormality during hormone therapy by transvaginal sonography between day 5 and day 10 after the drug intake.

RESULTS

GROUP A = 100 WOMEN WITH POST MENOPAUSAL BLEEDING

TABLE – 1:

AGE – DISTRIBUTION OF POSTMENOPAUSAL PATIENTS

Age of Patient	Number of patients	Percentage	Cumulative percentage
45 – 50 years	52	52.0	52.0
51 – 55 years	24	24.0	76.0
56 – 60 years	18	18.0	94.0
More than 60 years	6	6.0	100.0
Total	**100**	**100.0**	

Note : Half of the patients in the study belong to 45-50 years of age group.

TABLE – 2 :

PARITY DISTRIBUTION OF POSTMENOPAUSAL WOMEN WITH BLEEDING IN STUDY GROUP.

Age of Patient	Number of patients	Percentage	Cumulative percentage
Less than P - 2	30	30.0	30.0
Between P 3-4	38	38.0	68.0
More than P - 5	32	32.0	100.0
Total	**100**	**100.0**	

TABLE – 3

DURATION OF MENOPAUSE:

Duration in years	Number of patients	Percentage	Cumulative percentage
Less than 3	50	50.0	50.0
Between 3-5	18	18.0	68.0
Between 5-7	14	14.0	82.0
Between 7-9	6	6.0	88.0
More than 9	12	12.0	100.0
Total	**100**	**100.0**	

Note: 50% of the women have postmenopausal bleeding with in 3 years of attaining menopause.

TABLE – 4

ASSOCIATED MEDICAL CONDITIONS:

Medical conditions	Number of patients	Percentage	Cumulative percentage
Anaemia	4	4.0	4.0
Diabetes	8	8.0	12.0
Hypertension	6	6.0	18.0
Normal	82	82.0	100.0
Total	**100**	**100.0**	

Note : 8% of women with postmenopausal bleeding had diabetes mellitus during the study period.

TABLE – 5

ASSOCIATED FINDINGS IN TRANSVAGINAL SONOGRAM

Associated findings	Number of patients	Percentage	Cumulative percentage
Normal	78	78.0	78.0
Pyometra	10	10.0	88.0
Polyp	4	4.0	92.0
Fibroid	2	2.0	94.0
Endometrial abnormalities	6	6.0	100.0
Total	**100**	**100.0**	

Note: 10% of women had associated pyometra and only 4% of women had associated polyp.

TABLE – 6

ENDOMETRIAL THICKNESS BY USING TRANSVAGINAL SONOGRAM

Endometrial thickness	Number of patients	Percentage	Cumulative percentage
Less than 5 mm	52	52.0	52.0
More than 5 mm	48	48.0	100.0
Total	**100**	**100.0**	

Note: 48 % of women with postmenopausal bleeding had a endometrial thickness of more than 5mm

TABLE – 7

Comparison of histopathology (Fractional Curettage) with vaginosonographic measurement of endometrial thickness in

Group A - Women with Post menopausal bleeding.

Histopathology Report	Mean endometrial thickness in mm	Number of patients	Percentage	Cumulative percentage
Atrophic endometrium	3.75 (2-5)	42	42.0	42.0
Tissue insufficient for diagnosis (TIFD)	3.2 (1.2-5)	10	10.0	52.0
Cystoglandular hyperplasia	12.2 (10-14)	10	10.0	62.0
Complex hyperplasia	13 (13-14)	2	2.0	64.0
Nonsecretory endometrium	7.7 (6-8)	12	12.0	76.0
Secretory endometrium	8.75 (8-10)	8	8.0	84.0
Pyometra/ Endometritis	8.5 (8-10)	10	10.0	94.0
Endometrial carcinoma	16.7 (16-18)	6	6.0	100.0
Total		**100**	**100.0**	

Note :

- 52% of women with Atrophic endometrium or TIFD had a mean endometrial thickness less than 5 mm and 48% of patients with endometrial pathology had a thickness more than 5 mm.

- ❖ 42% of women had atrophic endometrium with a mean endometrial thickness of 3.75 mm. 10% of patients had tissue insufficient for diagnosis with a mean endometrial thickness of 3.2mm.

The incidence of endometrial hyperplasia was 12% with a mean endometrial thickness of 12.2mm. The incidence of nonsecretory endometrium was 14% with a mean endometrial thickness of 7.7 mm. The incidence of secretory endometrium was 8% with a mean endometrial thickness of 8.75mm. In 5 cases of pyometra, the mean endometrial thickness was 8.5 mm. 6% of cases had endometrial carcinoma with a mean endometrial thickness of 16.7mm.

Thus it can be seen that 52% of women with atrophic endometrium or tissue insufficient for diagnosis had a mean endometrial thickness less than 5mm and 48% of patients with endometrial pathology namely proliferative phase, hyperplasia, carcinoma of the endometrium and pyometra had a mean endometrial thickness more than 5mm.

This is comparable with the following studies.

(i) Narsi and associates at St. Bartholomew's hospital studies 111 women with postmenopausal bleeding – results were published in obstetric and gynaecologic surgery 1991.

51 patients (45.9%) had normal ultrasound findings and endometrial thickness was 1-5 mm. The remaining 54.1% of patients had an endometrial thickness of more than or equal to 6 mm. In 11 patients

(10%) ultrasound findings were suggestive of hyperplasia. In 6 women ultrasound correctly predicted carcinoma of endometrium. In 16 patients fibroids were diagnosed. Narsi *et al* suggested that an endometrial thickness of 5mm or less is associated with endometrial atrophy and curettage is unnecessary in this group.

(ii) Mahlinova and Pehlivanov conducted a prospective study of one 118 patients with postmenopausal bleeding. They compared transvaginal sonogram and endometrial thickness to histopathological reports in these women. (Published in the European Journal of obstetrics and gynaecology 1995 February).

In 47.0% of women with histopathological diagnosis of atrophic endometrium the mean endometrial thickness was 3.1 $\pm$ 1.7 mm whereas in the remaining 53% of women with endometrial abnormalities the endometrial thickness ranged from 10.2mm. The mean endometrial thickness for patients with endometrial carcinoma was 18.4 $\pm$ 8.2mm.

No endometrial carcinoma was diagnosed in endometrial thickness less than or equal to 5mm. The sensitivity was 100% and specificity 64% if a cutoff of 5mm was used.

TABLE – 8

Comparison of ultrasonographic findings with histopathologic diagnosis of fractional curettage and hysterectomy specimen in women with postmenopausal bleeding.

Ultrasonographic findings	Number of patients	FC – HPE report	Hysterectomy HPE report
Thin distinct pencil line echo less than or equal to 5mm	52	10-TIFD 42-Atrophic endometrium	10- Atrophic endometrium 38- Atrophic endometrium 4 – Lost for followup
Endometrial thickness more than 5 mm	26	6-C.G.H 2-C.H 10-N.S.E. 8-S.E	6-C.G.H. 2-C.H. 10-N.S.E. 8- S.E.
Fibroid	2	Fibroid Not diagnosed 2-C.G.H.	2- 2 x 2.0 cm anterior wall fibroid
Endometrial carcinoma	6	6-endometrial carcinoma	2 - Fibroid anterior wall 2x2 cm seen in association with endometrial carcinoma 4- well differentiated adenocarcinoma. Grade-I Myometrial invasion less than 1/3
Endometrial Polyp	4	2-N.S.E. 2- C.G.H Polyp not diagnosed	An endometrial polyp 1x1 cm seen. 2- N.S.E. 2 – C.G.H.
Pyometra	10	10-Pus letout and endometritis	4 – Endometritis 2 – Atrophic endometrium 2 – Secretory endometrium 2 – Lost for follow-up

TIFD - Tissue Insufficient for Diagnosis

C.G.H - Cysto Glandular Hyperplasia

N.S.E - Non Secretory Endometrium

S.E - Secretory Endometrium

F.C. - Fractional Curettage

C.H. - Complex Hyperplasia

Note : The findings of the transvaginal sonogram correlated well with the final histopathologic diagnosis after hysterectomy giving a sensitivity of 92.31% and specificity of 67.57%. There were no false negative and false positive findings. Fractional Curettage missed 3 fibroid polyps and one endometrial polyp.

In 52 patients transvaginal sonogram showed that an endometrial thickness of less than or equal to 5 mm and the histopathology report after hysterectomy report was atrophic endometrium. Endometrial abnormality was suggested in the remaining 48 cases. In these 48 patients, there were 2 cases of fibroid, 4 case of endometrial polyp, 6 cases of endometrial carcinoma, 10 cases of pyometra, 26 cases with endometrial echo more than 5mm were associated with endometrial hyperplasia including two cases with complex hyperplasia with or without atypia. All these patients underwent hysterectomy and the histopathology findings of the hysterectomy specimen correlated well with the findings of transvaginal sonogram giving a sensitivity of 92.31% and specificity of 67.57%.

The findings of the present study are comparable with that of the following studies (i) Dubinsky TJ, Parvey HR and Maklad N has evaluated

with role of transvaginal sonography and endometrial biopsy in the evaluation of postmenopausal bleeding published in the American Journal of Roentgenology 1996 July.

They have evaluated the reliability of transvaginal sonogram in diagnosing intrauterine disease by comparing it with hysterectomy specimen. In 259 women transvaginal sonogram was done.

The findings were

- Endometrial thickness less than or equal to 5mm in 107 women.
- Endometrial thickness of more than 5mm in 39 women.
- Enlarged uterus in 64 women.
- Endometrial carcinoma in 18 women.

Final pathologic diagnosis were

- Atrophic endometrium in 107 women.
- Endometrial hyperplasia in 39 women.
- Endometrial carcinoma in 18 women with enlarged uterus.
- Fibroids in 57 women.
- Adenomyosis in 3 women.
- Sarcoma in 4 women.

In their study the correlation between transvaginal sonogram and histopathological report of hysterectomy specimen was very accurate in

yielding sensitivity of 96%, specificity of 86%, positive predictive value of 91% and negative predictive value of 94%.

(ii) Weber in their study of transvaginal sonogram in 28 women with postmenopausal bleeding found that 14 patients had normal sonogram with an endometrial thickness less than or equal to 5mm and 14 patients had endometrial thickness more than or equal to 5 mm with endometrial abnormalities. All these patients underwent hysterectomy and findings correlated with a transvaginal sonogram giving sensitivity of 94%, specificity of 48%, positive predictive value of 69% and negative predictive value of 89%.

GROUP- B: 100 WOMEN WITH PERIMENOPAUSAL BLEEDING

TABLE – 1:

AGE – DISTRIBUTION OF PERIMENOPAUSAL WOMEN WITH BLEEDING IN A STUDY GROUP

Age of Patient	Number of patients	Percentage	Cumulative percentage
41 – 45 years	64	64.0	64.0
46 – 50 years	28	28.0	92.0
51 – 55 years	8	8.0	100.0
Total	**100**	**100.0**	

Note : More than 60% of the patients in the study group belongs to 41-45 years of age.

TABLE – 2 :

PARITY DISTRIBUTION IN THE PERIMENOPAUSAL STUDY GROUP.

Age of Patient	Number of patients	Percentage	Cumulative percentage
Less than P - 2	28	28.0	28.0
Between P 3-4	60	60.0	88.0
More than P - 5	12	12.0	100.0
Total	**100**	**100.0**	

Note : More than half of the patients in the study group between para 3 and para 4.

TABLE – 3

ASSOCIATED MEDICAL CONDITION

Medical conditions	Number of patients	Percentage	Cumulative percentage
Anaemia	16	16.0	16.0
Hypertension	10	10.0	26.0
Normal	74	74.0	100.0
Total	**100**	**100.0**	

Note : Anaemia was the most common medical condition associated with perimenopausal women with bleeding in a study group (16%)

TABLE – 4

ASSOCIATED FINDING IN TRANSVAGINAL SONOGRAM

Associated pelvic findings	Number of patients	Percentage	Cumulative percentage
Adenomyosis	16	16.0	16.0
Myomatous polyp.	14	14.0	30.0
Ovarian cyst.	6	6.0	36.0
Endometrial polyp.	4	4.0	40.0
Endometrial abnormalities	2	2.0	42.0
Normal	58	58.0	100.0
Total	**100**	**100.0**	

Note : 16% of perimenopausal women have an associated adenomyosis and only 4% of endometrial polyp.

TABLE – 5

ENDOMETRIAL THICKNESS BY USING TRANSVAGINAL SONOGRAM

Endometrial thickness	Number of patients	Percentage	Cumulative percentage
Less than 15 mm	74	74.0	74.0
Between 15 - 25 mm	24	24.0	98.0
More than 25 mm	2	2.0	100.0
Total	**100**	**100.0**	

Note: Only 2% perimenopausal women with bleeding had endometrial thickness more than 25mm

TABLE – 6

Comparison of histopathology with vaginosonographic measurement of endometrial thickness in perimenopausal group.

Histopathology Report	Mean endometrial thickness in mm	Number of patients	Percentage	Cumulative percentage
Nonsecretory endometrium	8.4 (5-10)	60	60.0	60.0
Secretory endometrium	10.8 (10-13)	12	12.0	72.0
Cystoglandular hyperplasia	17.1(16-19)	20	20.0	92.0
Adenomatous hyperplasia	20	2	2.0	94.0
Atypical hyperplasia	23	2	2.0	96.0
Endometritis	11	2	2.0	98.0
Endometrial carcinoma	27	2	2.0	100.0
Total		**100**	**100.0**	

Note : With an endometrial thickness less than or equal to 15mm the histopathology report is normal endometrium. When the endometrial thickness more than or equal to 15mm the histopathology report is hyperplasia or carcinoma.

In this group, those with a nonsecretory endometrium have a mean endometrial thickness of 8.4mm, with secretory endometrium of 10.8 mm, with cystoglandular hyperplasia of 17.1mm, with adenomatous hyperplasia the thickness was 20 mm, with atypical hyperplasia was 23 mm, with endometritis was 11mm and with endometrial carcinoma was 27mm.

72 cases (72%) of women with perimenopausal bleeding had normal endometrium by transvaginal sonogram and had a mean endometrial thickness of 8.8mm with a range of 5-13mm. For all these patients the histopathological report was either nonsecretory endometrium or secretory endometrium.

In the remaining 28 cases (28%) with endometrial abnormality, the endometrial thickness was found to range from 16mm in a case with cystoglandular hyperplasia to 23 mm for atypical hyperplasia to 27 mm for a case with endometrial carcinoma.

Therefore it can be seen that below an endometrial stripe thickness less than or equal to 15mm the histopathology report was normal endometrium either secretory or non secretory. An endometrial stripe thickness more than or equal to 15mm has been found to be associated with hyperplasia including one adenomatous and one atypical hyperplasia.

The results of this present study are compared with the results of the following study.

(i) Emmanuel, Mark, Marion, Verdel and Lammes in the American Journal of Obstetrics and gynaecology have determined the diagnostic value of

transvaginal sonogram for endometrial and intrauterine abnormalities in women with perimenopausal bleeding.

In 279 consecutive perimenopausal women with abnormal uterine bleeding were subjected to transvaginal sonogram. Though a cutoff value for endometrial thickness in premenopausal patients is not available in the literature, they have found that in their study population a cutoff level of 12 mm for normal premenopausal endometrium was adequate with no false negative or false positive results.

135 patients with normal sonogram were confirmed to be true negative by histopathological examination. The mean thickness of the endometrium was 5.8 $\pm$ 2.8mm (range 1-12 mm). Abnormal sonogram found in 121 patients had a mean thickness of

14.3 $\pm$2.3mm (range 13-20 mm). The "thinnest" endometrial hyperplasia was found to be 13mm. With these findings a cutoff level of 12mm was found to be adequate in this study population with a sensitivity and specificity of 100%.

(ii) Towbi, Gnazda March published in the American Journal of obstetrics and gynaecology June 1996, examined 131 patients with perimenopausal bleeding by transvaginal sonogram. As the maximum thickness of the endometrium is 14mm an endometrial echo complex is considered thickened if it is more than or equal to 15mm.

They have found that a thickened endometrial stripe more than or equal to 15mm is a better predictor of intracavitory pathologic disorders in the follicular phase than in the luteal phase. 59 patients had a normal sonogram with endometrial stripe less than or equal to 15mm. Rest of the patients had endometrial stripe more than or equal to 15mm. Of these 6 patients with endometrial stripe more than or equal to 15mm with no other structural abnormalities were found to have hyperplasia of endometrium. 52 patients had Ultrasonography results consistent with leiomyomas 11 had thickened uterine wall and 2 had polypoid lesion. No case of endometrial carcinoma was reported.

Hence they have suggested that a thick endometrial echo complex in the follicular phase more than or equal to 15mm correlates strongly with the presence of intracavitory pathologic disorders and endometrial abnormalities.

The results of this study are found to be comparable with that of the present study.

TABLE – 7

Comparison of transvaginal sonographic findings with histopathologic diagnosis of fractional curettage and hysterectomy in women with perimenopausal bleeding

Ultrasonographic findings	Number of patients	FC – HPE report	Hysterectomy HPE report
Normal endometrium thickness less than or equal to 15 mm	50	38-N.S.E. 12-S.E	28-N.S.E. 6-S.E 16- followed up with Transvaginal sonogram
Endometrial thickness more than or equal to 15 mm	12	10-C.G.H 2-Adenomatous hyperplasia	10-C.G.H 2-Adenomatous hyperplasia
Adenomyosis	16	8-N.S.E. 8- C.G.H	16 - Adenomyosis
Myomatous polyp	14	10-N.S.E. 2- C.G.H 2 – Atypical hyperplasia	10-N.S.E. 2- C.G.H 2 – Atypical hyperplasia
Endometrial Polyp	4	4-N.S.E.	4 - Endometrial Polyp with N.S.E.
Endometritis	2	2- Endometritis	2– Endometritis
Endometrial carcinoma	2	2-Adenocarcinoma	2 – lost for followup

Note : Findings of transvaginal sonogram correlated well with histopathological report after hysterectomy. 16 cases of adenomyosis, 14 cases of myomatous polyp and 4 cases of endometrial polyp were missed by fractional curettage.

Out of 100 perimenopausal patients, 72 had normal endometrium both by transvaginal sonogram and histopathologic diagnosis. In this 16 cases

were followed up with transvaginal sonogram and remaining cases underwent hysterectomy. 12 cases with endometrial thickness greater than 15mm and no other abnormal intracavitory, pathology were found indeed to have endometrial hyperplasia as per hysterectomy specimen. 16 cases of adenomyosis, 14 cases of myomatous polyp and 4 cases of endometrial polyp were all diagnosed by transvaginal sonogram which correlated well with the pathological diagnosis after hysterectomy giving a sensitivity of 92.86%, specificity of 100%, positive predictive value of 100% and negative predictive value of 97.3%.

This is compared with the following studies.

(i) March and Tombin evaluated 149 consecutive patients with perimenopausal bleeding by transvaginal sonography and the findings were compared with specimen obtained from hysterectomy used to represent the true diagnosis. The findings after transvaginal sonogram was normal in 59 patients, intramural myoma in 52 patients, thickened uterine wall in 11 patients and polypoid lesion in 2 patients. The final pathological diagnosis after hysterectomy was hyperplasia in 6 patients, adenomyosis in 11 patients, myoma in 52 patients, polyps in 72 patients and normal in 7 patients. It is seen that myomas and adenomyosis correlated well with the final pathological diagnosis, out of which 15 endometrial polyps were missed by transvaginal sonogram. Normal pathology was seen only

in 7 patients all these giving a sensitivity of 54% and specificity of 90%. They concluded that the limiting factor with transvaginal sonogram is the high frequency of “equivocal” scans.

(ii) Emmanual et al in their analysis of 279 women with perimenopausal bleeding subjected to transvaginal sonogram and compared with final pathological diagnosis at hysterectomy. They found that 135 patients with normal sonogram when compared with final pathological diagnosis endometrial polyps were not visualised in 4 premenopausal patients marked by very hyperecho dense late secretory endometrium. These would have been visualised well, if carried out during proliferative phase. In 54 patients submucous myomas , in 5 patients endometrial hyperplasia and in 6 patients with endometrial carcinoma were diagnosed correctly. Transvaginal sonogram was in conclusive in 19 patients giving sensitivity of 96%, specificity of 61% and positive predictive value of 39% .

DISCUSSION

In the group with postmenopausal bleeding the thickness of endometrium ranged from 1.2 mm in a women with atrophic endometrium to 18mm in a woman with well differentiated stage - I endometrial carcinoma.

The percentage of carcinoma endometrium was 6% and the endometrial hyperplasia was 12%. In 52% of women were found to have an atrophic endometrium to tissue insufficient for diagnosis.

Out of 100 women with normal sized uterus on examination 2 myomatous polyps, 4 endometrial polyp and 10 cases of pyometra were diagnosed by ultrasonogram. These findings correlated with pathological diagnosis after hysterectomy.

A transvaginal ultrasound measured endometrial thickness of 5mm and less was associated with an atrophic, active endometrium or tissue insufficient for diagnosis in the histopathological report.

Endometrial pathology and abnormalities were found only among those women whose endometrial thickness was greater than 5 mm.

Various studies have been conducted in the last five years and the results of some are compared with the present study.

TABLE 1

Endometrial thickness is measured by transvaginal sonography for identifying endometrial abnormality in women with postmenopausal bleeding. A comparison of various study groups.

Study group	No. of patients	Cutoff point in mm	Sensitivity %	Specificity %	PPV %	NPV %
Lewin et al	50	5	100.0	64.0	-	-
Kufahl et al	181	4	90.3	24.8	21.4	91.9
Curci-CA et al	35	3	93.10	66.66	-	-
Wolman	54	6	89.0	83.0	-	-
Conoscenti et al	149	4	95.2	96.1	68.7	93.2
Weber	159	5	94.0	48.0	69.0	87.0
Kekre et al	80	4	97.0	98.0	97.0	94.0
Present study	100	5	92.31	67.57	50.0	96.15

PPV – Positive predictive value ; NPV - Negative predictive value

The purpose of the study of Lewin et al was to evaluate endometrial thickness as the only parameter for excluding endometrial abnormalities. In this study no endometrial abnormality was found if the endometrium was less than 5mm thick. Out of 32 patients whose endometrial thickness was more than 5mm, 22 had pathological changes in the endometrium. These included 6 cases of endometrial cancer and 16 with benign changes.

Kufahl et al in their study of 181 postmenopausal women with bleeding reported that endometrial thickness of less than 5mm is uniformly associated with minimal tissue obtained by sampling or an atrophic endometrium. They

had one malignancy in this series. They described it as a very sensitive but not a very specific technique (Sensitivity of 90.3% and Specificity of 24.8%).

Curci-CA et al in their prospective study of 35 postmenopausal women not on hormone replacement therapy reported that an endometrium of more than 3mm associated with abnormality. They found vaginal sonography to be a highly specific and sensitive method for the detection of endometrial pathology.

Wolman et al in their analysis of 54 postmenopausal women found that the sensitivity of vaginal ultrasonography for endometrial disease was 89% if 6mm was used as the cutoff point for endometrial thickness.

Conoscenti et al in their study of 149 postmenopausal women with cutoff point of endometrial thickness was 4mm showed sensitivity of 95.2 and specificity of 96.1% for endometrial pathology.

Weber and Kekre et al showed similar results with endometrial thickness between 4 to 5 mm.

GROUP A: WOMEN WITH POSTMENOPAUSAL BLEEDING

In the present study of 100 women with postmenopausal bleeding using 5mm as a cutoff limit, vaginal sonography successfully diagnosed endometrial abnormality.

The results obtained were

- Specificity of 67.57%.
- Sensitivity of 92.31%.
- Positive predictive value of 50%.
- Negative predictive value of 96.15%.
- Diagnostic accuracy of 74%.

In 100 women with normal pelvic examination, pyometra was diagnosed in 10 cases, polyp was diagnosed in 4 cases, Endometrial carcinoma was correctly diagnosed in 6 cases. Here the ultrasonographic findings correlated well with the pathological report of the hysterectomy specimen.

GROUP B: WOMEN WITH PERIMENOPAUSAL BLEEDING

In women with perimenopausal bleeding the percentage of endometrial carcinoma was 2%, endometrial hyperplasia was 24%, adenomyosis was 16%, myoma uterus was 14%, endometrial polyps was 4% and endometritis

was 2%. Out of interest, 4 cases of endometrial biopsy was taken through hysteroscope.

In 100 women with normal pelvic examination adenomyosis was diagnosed in 16 cases, myoma was diagnosed in 14 cases and endometrial polyp diagnosed in 4 cases. Endometrial carcinoma was correctly diagnosed in 2 cases. The ultrasonographic findings correlated well with the pathological report of the hysterectomy specimen.

The results obtained were

- Sensitivity of 92.86%.
- Specificity of 100%.
- Positive predictive value of 100%.
- Negative predictive value of 97.3%.
- Diagnostic accuracy of 98%.

In this study 72% of women with normal endometrium had an endometrial thickness of less than 15mm below which there was no endometrial pathology. Above this cutoff level were found to associated with endometrial pathology.

TABLE 2

Endometrial thickness is measured by transvaginal sonography for identifying endometrial abnormality in women with perimenopausal bleeding. A comparison of various study groups.

Study group	No. of patients	Cutoff point in mm	Sensitivity %	Specificity %	PPV %	NPV %
Get Pook et al	111	8	83.9	58.8	-	90.4
Minagawa et al	125	20	100.0	99.1	92.9	100.0
Towbin March et al	131	15	100.0	86.0	91.7	94.0
Emmanuel et al	279	12	79.0	93.0	-	-
Fleischer et al	62	15	85.0	21.0	-	-
Kalantaridou	80	13	100.0	71.64	40.62	-
Present Study	100	15	92.86	100	100	97.3

PPV – Positive predictive value ; NPV - Negative predictive value

Getpook et al in a study involving 111 patients, established a sensitivity of 83.9% and negative predictive value of 90.4% by considering 8mm as the cutoff point beyond which intrauterine pathology and endometrial abnormalities were present that is 31 (27.9%) had an abnormal endometrium i.e. hyperplasia 13.5%, polyps 5.4%, submucous myoma 5.4% and adenocarcinoma 3.6%.

Minagawa's study of 131 patients, with a cutoff a 15mm, yielded a sensitivity of 100% and a specificity of 99.1%. The histological diagnosis of

the endometrium included 13 endometrial cancers, 9 endometrial hyperplasias (one atypical hyperplasia and 3 hyperplastic polyps), and 10 normal endometrium.

Towbin, March et al had found that in their analysis of 131 patients with perimenopausal bleeding, a thick endometrial stripe of more than or equal to 15mm were found to correlate strongly with the presence of intrauterine pathology and endometrial abnormalities. Sensitivity of 100%, specificity of 86%, positive predictive value of 91.7% and negative predictive value of 94%.

Emmanuel, Mark, et al in the year 1995 in their analysis of 279 women with perimenopausal bleeding have found a cutoff value of 12mm for endometrial thickness below which the report was normal endometrium and above which it was associated with endometrial pathology.

Emmanuel et al have also stated that though in the literature, normal cutoff levels for premenopausal endometrial thickness were not available. He concluded from his study that such a cutoff level can be assigned to the premenopausal patients for exclusion of endometrial abnormalities as is available in postmenopausal patients.

Fleischer reported a sensitivity of 85% in his study of 62 patients with 15mm as the cutoff point for endometrial thickness.

Kalantaridou with a cutoff value of 13mm in 80 patients achieved 100% sensitivity.

SUMMARY

- Study consists of 200 patients, 100 patients with perimenopausal bleeding and 100 patients with postmenopausal bleeding.

- In women with postmenopausal bleeding, when the endometrial thickness less than or equal to 5mm in transvaginal sonogram the histopathological report was atrophic endometrium. When the endometrial thickness was more than 5 mm it was associated with endometrial pathology. This yields sensitivity of 92.31%, specificity of 67.57%, and positive predictive value of 50% and negative predictive value of 96.15%.

- In women with perimenopausal bleeding, when the endometrial thickness was less than or equal to 15mm in transvaginal sonogram, the histopathological report was proliferative or secretory endometrium. When the endometrial thickness was more than or equal to 15mm the report was endometrial hyperplasia or carcinoma. This yields sensitivity of 92.86%, specificity of 100%, and positive predictive value of 100% and negative predictive value of 97.3%.

- In both groups of women with perimenopausal and postmenopausal bleeding, intrauterine abnormalities of endometrium and myometrium

as adenomyosis, myomatous polyps and endometrial polyps were diagnosed.

- Cases with endometrial hyperplasia and endometrial adenocarcinoma were diagnosed with precision by transvaginal sonogram and myometrial invasion was also predicted.

- In women with perimenopausal bleeding, transvaginal sonogram picked up 16 cases of adenomyosis, 14 cases of myomatous polyps and 4 cases of endometrial polyps which were missed by fractional curettage.

- In women with postmenopausal bleeding transvaginal sonogram picked up 2 cases of myomatous polyps and 4 case of endometrial polyp which were missed by fractional curettage.

CONCLUSION

Transvaginal sonogram is a simple, non-invasive convenient way to indirectly visualize the endometrial cavity.

The vaginal probe examination if incorporated into the gynaecology office setting and when combined with bimanual pelvic examination can enhance our anatomic diagnosis.

Transvaginal sonography is useful as a first step diagnostic procedure in the evaluation of perimenopausal and postmenopausal bleeding.

When combined with fractional curettage it can supplement the shortcomings of fractional curettage.

This study proves that this diagnostic tool correlates well with the histopathology findings.

Intrauterine pathology of the endometrium and myometrium were well preciously delineated and endometrial hyperplasia and endometrial carcinoma could be detected. It can also find out associated ovarian pathology.

In future it appears that the ultrasonogram will continue to take the role of a stethoscope for the gynaecologist, to see the lining of the uterine cavity and the information obtained seems worthwhile.

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PROFORMA

Measurement of endometrial thickness in women with peri and post menopausal bleeding and its correlation with histopathology.

Name : Age : I.P. No. :

D.O.A. : Residence

D.O.D. :

C/o. : Bleeding pv or
discharge pv.

HISTORY OF PRESENT ILLNESS

Bleeding pv since
Profuse/Moderate/scanty
H/o of passing clots
Discharge pv since.

Menstrual H/o

Age of menarche	
Menstrual cycle /days	regular/irregular
	Profuse/Moderate/Scanty
Dysmenorrhoea	Present/Absent
Inter menstrual bleeding	
Date of L.M.P.	
Menopause	Attained/Not attained
	Years

Treatment H/o

Earlier contraceptive history
Oral contraceptive Pills
Intra uterine contraceptive device
Hormone replacement therapy

Obstetrical H/o

Married life Parity Living children
Last child birth Sterilisation

Past History H/o Tuberculosis

H/o Diabetes mellitus
H/o Hypertension
H/o Bleeding disorders
H/o Any D & C in the past
H/o Any surgery

Family History

Tuberculosis	Hypertension
Diabetes Mellitus	Carcinoma

Personal History

Obesity	Diet	Sleep	Micturition
	Appetite	Bowel	

Physical Examination

General condition	Build
Nourishment	Temperature
Pulse Rate	B.P.
Pallor	Teeth
Gums	Thyroid
Jaundice	Neck veins
Oedema	
Lymph nodes	

Per Abdomen

Vaginal Examination

Inspection of vulva
Palpation of external genitalia

P/s Vagina
Cervix

P/v	Cervix		Position	Discharge
	Uterus	Position	Size	Mobile/Restricted
	Fornices			

Investigations

Blood Group and Rh

Hemogram
Blood urea
Serum creatinine
Blood sugar (Random)
Urine analysis
Bleeding time
Clotting time
Pap smear

Vaginal Sonography

Uterus
Endometrial thickness
Endometrial volume
Cervix
(R) Ovary
(L) Ovary
Ovarian volume (R)
(L)
Any other abnormalities

Diagnosis

Remarks

Dilation & Curettage

Endocervical curettings
Uterine cavity sounded upto
Regular / Irregular
Technical difficulty
Specimen amount
Biopsy cervix

Hysterectomy

Histopathology report